RESEARCH DEPARTMENT

The Sennheiser type MKH 805 microphone

TECHNOLOGICAL REPORT No. L-066

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THE BRITISH BROADCASTING CORPORATION
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RESEARCH DEPARTMENT

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THE SENNHEISER TYPE MKII 805 MICROPHONE

SUMMARY

This report describes tests carried out on a capacitor type end-fire line microphone made by the German firm of Sennheiser. The head amplifier has transistor circuits and radio frequency biassing of the capsule.

Measurements have been made of the frequency characteristics on the axis and at a number of angles to it; the degree of interference from wind and from magnetic fields has also been determined. The quality of reproduction is high and the degree of interference is very low.

1. INTRODUCTION

The Sennheiser company in Germany has introduced two new capacitor type line microphones, types MKH 804 and 805, which have a directional characteristic narrower than a cardioid over most of the frequency band, and may be compared with the Electrovoice type 642[1] which is similar in length. In microphones of this type, the directional characteristic is obtained by sampling the sound pressure at a number of points along an acoustic transmission line; if the device is to possess appreciable directional properties, it is essential that the maximum overall distance between the points should be at least comparable with a wavelength. Further details are given in Reference 1. The only differences between the types 804 and 805 are the output impedance and power supply arrangements; this report deals exclusively with the type 805. The price to the BBC is £46 approximately; a battery holder type MZA6 is available at an extra cost of £5. 4s. 0d.

2. DESCRIPTION

Fig. 1 shows the external appearance and dimensions. The acoustic line is 17 in. (430 mm) long; at low frequencies, at which a line of this length cannot be directional, the capacitor element operates as a conventional cardioid microphone.

Transistors are used in the head amplifier and radio frequency biassing of the capsule is employed; this arrangement is claimed to give a high ratio of signal to electrical noise, an essential feature if full use is to be made of the directional properties of the microphone by working further from a programme source. The circuit is similar to that employed for the Sennheiser type MKH 404 described elsewhere[2].

Weight: The weight of the microphone without cable is 12½ oz (350 g).

3. PERFORMANCE

3.1. Method of Measurement

The frequency characteristics of the microphone above 200 c/s were measured by comparison with a pressure standard in a free-field room at a distance of 20 ft (6·1 m) from the sound source. The corresponding measurements at lower frequencies were carried out in a travelling wave duct again by comparison with a pressure standard. Generally the accuracy of comparison is ± ½ dB, but errors of ± 1 dB can occur for sound incident at angles greater than 90°.

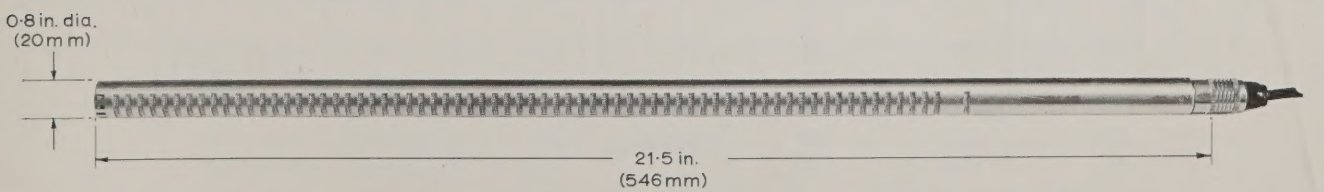

Fig. 1 - Appearance and dimensions of Sennheiser microphone type 805

3.2. Frequency Characteristics

Fig. 2 shows the frequency characteristics for sound incident at 0°, 45°, 90° and 180° to the axis. At high frequencies the curves are very ragged, presumably owing to imperfect acoustic termination of the tube forming the directional element; only the envelope of the irregularities is given. It will be noted that the average curve of the axial characteristic is fairly smooth and extends to high frequencies, but curves for sound incident at other angles are rather irregular. However, the mean directional characteristics are more nearly independant of frequency than those of the Electrovoice microphone type 642.

3.3. Impedance

The impedance is nominally 15 ohms; the measured modulus of the impedance is shown in Fig. 3, where it will be observed that apart from low frequencies it is largely independent of frequency and equal to about 8 ohms. However, the makers recommend that the microphone should be connected to a load of not less than 200 ohms and under these conditions the on-load frequency characteristics do not differ significantly from the open-circuit curves given in Fig. 2.

3.4. Sensitivity

The radio-frequency bias applied to the capsule, and hence the sensitivity, will vary with the battery voltage. With new batteries the mid-band sensitivity is -51 dB with reference to 1 volt/dyne/cm^2.

4. NOISE

4.1. Internally Generated Noise

The internally generated noise appearing at the microphone output is a combination of noise in the transistor and diodes and of thermal agitation in the resistive component of the base circuit impedance.

The open-circuit noise when weighted by an aural sensitivity network ASN/3 is -106 dB with reference to 1 volt. The mid-band sound pressure required to give the same output level is +19 dB with reference to 0·0002 dyne/cm^2; this figure is lower than that for most studio microphones and nearly as low as that from the Electrovoice type 642.

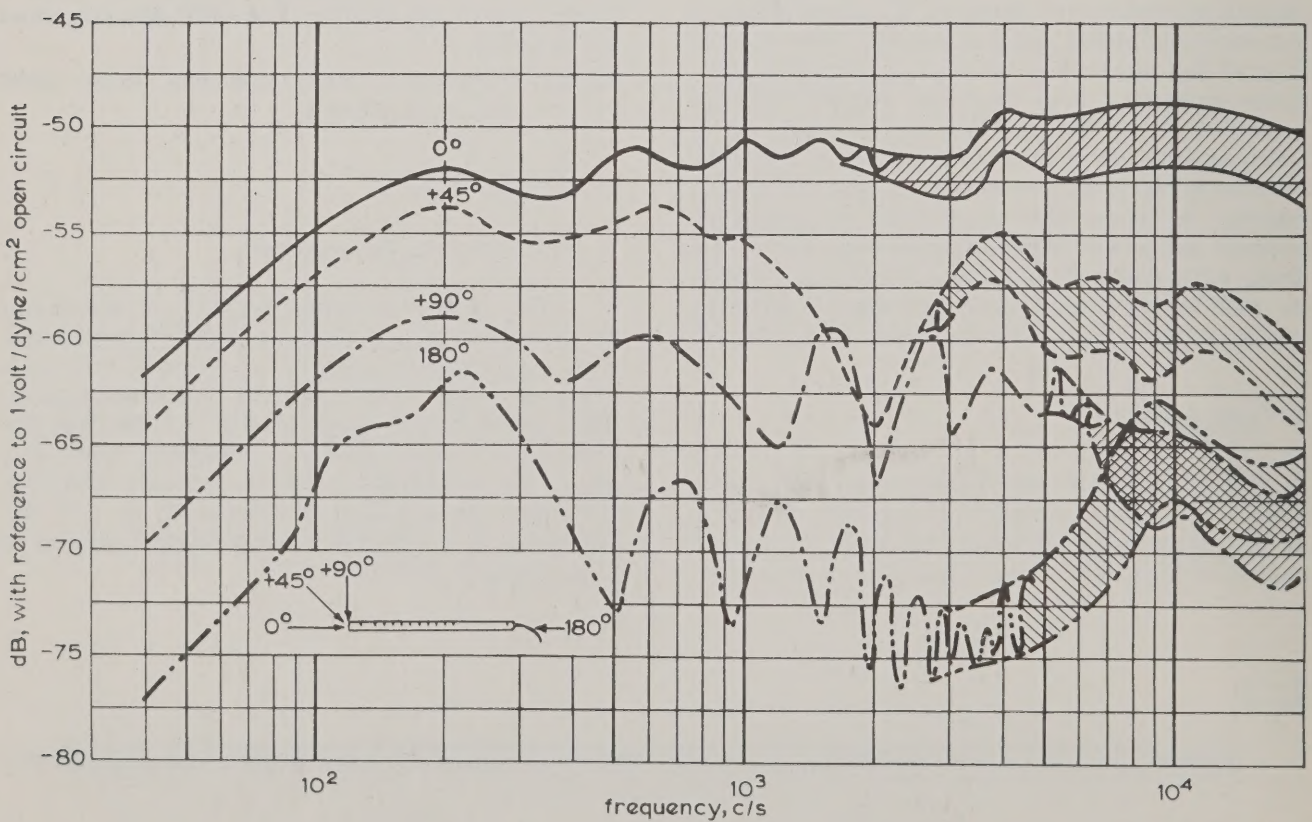

Fig. 2 - Frequency characteristics of Sennheiser microphone type 805, serial no. 64959

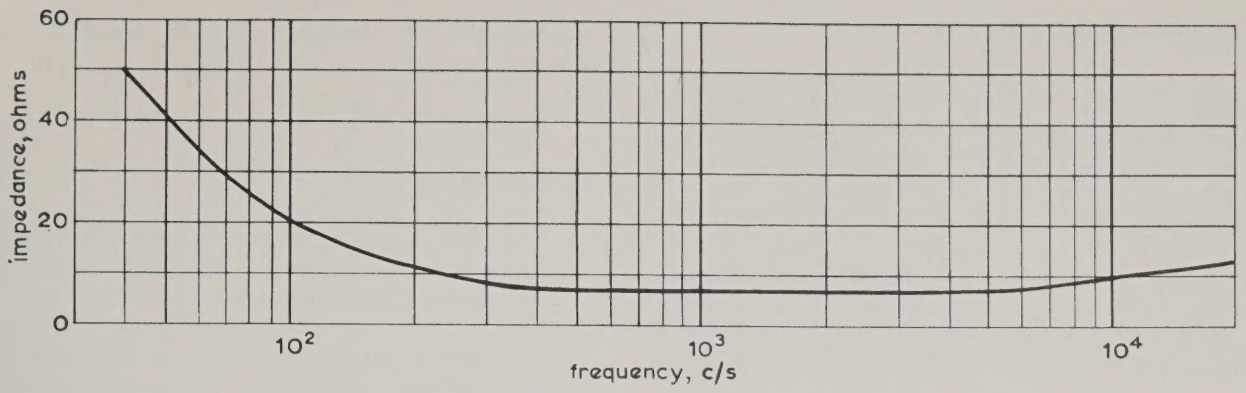

Fig. 3 - Modulus of impedance of Sennheiser microphone type 805, serial no. 64959

4.2. Interference from Magnetic Fields

Measurements were made of the open-circuit voltage induced in the microphone by a uniform magnetic field at 50 c/s, 1 kc/s and 10 kc/s, the relative orientation being adjusted at each frequency to give the greatest output. The unweighted mid-band sound levels, with reference to 0·0002 dyne/cm² required to give an output equivalent to that produced by a field of 1 milligauss at the frequencies mentioned are -8 dB +1 dB and +20 dB respectively. These levels are regarded as extremely low and should cause no trouble under normal studio conditions.

4.3. Wind Noise

Measurements were made of the wind noise generated when the microphone was placed at various angles to a streamlined airflow of 10 m.p.h. (16 km/h) and also at 40 m.p.h. (64 km/h) since this type of instrument might be used out of doors. To permit comparison with other microphones having a different frequency characteristic at the bass, the measurements were repeated with the microphone electrically equalised to give an axial frequency characteristic within ±1 dB from 1 kc/s down to 40 c/s; below 40 c/s the response was attenuated by a high-pass filter. The open-circuit noise was weighted by the standard ASA* network and measured on a V.U. meter; the results are given in the table below in terms of the sound level at 1 kc/s, which would give the same r.m.s. output from the microphone.

The noise levels are considered to be very low for these wind speeds; those for 40 m.p.h. (64 km/h) are no higher than often obtained from studio type microphones at a wind speed of 10 m.p.h. (16 km/h).

4.4. Interpretation of Noise Measurements

In applying the results given in the preceding sections it should be remembered that this type of microphone is likely to be employed at a greater distance from the source than would a normal studio instrument and under these conditions the level of the sound picked up will be correspondingly lower. It should also be appreciated that the aural sensitivity weighting employed is intended to give an indication only of the loudness of the noise. The subjective assessment of the annoyance caused depends on such factors as the degree to which the interference may be masked by studio "atmosphere" and other background noise.

* American Standards Association, Standard Z.24.3 - 1944 "Sound Level Meters for Measurement of Noise and other Sounds".

		Angle				
		0°	45°	90°	135°	180°
		Sound level, dB with reference to 2×10^{-4} dyne/cm²				
10 m.p.h. (16 km/h)	Unequalised	68	62	59	57	53
	Equalised	73	65	64	63	61
40 m.p.h. (64 km/h)	Unequalised	89	104	90	101	88
	Equalised	97	111	97	109	95

5. CONCLUSIONS

The response of this microphone is well maintained at high frequencies; the bass response is not so uniform but is probably adequate for most purposes. The directional characteristic, although not very narrow, varies much less with frequency than does that of most line microphones. The internally generated noise level is low and the directional characteristic can therefore be utilized by working at a greater distance from the programme source while preserving an adequate signal-to-noise ratio.

The wind noise is low and no trouble should be experienced in studios or with moderate wind speeds out of doors.

6. REFERENCES

1. The Sennheiser type MD 82 and Electrovoice type 642 microphones. Research Department Report No. L-052, Serial No. 1962/41.

2. The AKG type 628 and Sennheiser type MKH 404 microphones. Research Department report in preparation.